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Management Systems Laboratories "The Systems Approach to Management"

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Automating a Detailed Cognitive Task Analysis for Structuring Curriculum

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Over the past three months we have made considerable progress in the development of our cognitive analysis authoring system. A presentation and demonstration of our developments was given at ONR on May 7th, 1992. I feel our efforts were well appreciated as per the interest generated by the participants.

We are continuing to design and implement refinements to the system in order to elicit greater detail especially with regard to primitive mental operators. Our initial evaluations have indicated users are typically not cognizant of these mental operators and consequently do not record them when building their models. We have completed the design for the Decide operator which appears to be most readily elicited by users. This includes IF-THEN, IF-THEN-ELSE, and GOTO operators. We have FTP'd a copy of Word Net and have identified synonyms for decide, retain, recall, and retrieve. The system will monitor the use of these terms and their synonyms and will automatically set them to the primitive operator status. If decide, its synonyms or statements containing IF, THEN, or ELSE are detected by the system, the user will be presented with a dialogue box explaining that a decision is implied by the step description. A format for specifying conditions and operators to be executed, if the conditions are met, is presented to the user. We have allowed for "anding" any number of conditions in this format. To create conditionals which require an "or" the user is instructed to create another decide step immediately succeeding the current decide step. This seemed to be the most explicit way of handling decide steps. As for the other primitive operators, no special formats are required, they are handled like any other step. The problem is going to be eliciting steps like recall, refrain, forget, and retrieve. These are working memory and long term memory operators. Very few users, if any, will be familiar with these operators and how they should be used excepting for those that are intimately familiar with GOMS. We are attempting to provide some facilitation as Stan suggested during the training and familiarization sessions proceeding each subjects interaction with the tool.

Our experimentation is designed to determine if users can generate accurate models of a Macintosh "cut and paste" document, editing task by comparing the models generated by the tool to a baseline model which David Kieras developed. We are also going to analyze for the consistency of the models generated by test subjects among themselves independent of the baseline. We may not be getting completely accurate models due to these mental operators. However, we may be getting very consistent

models between users. It may turn out that some expert at GOMS will have to edit a resultant user model by inserting these mental operators where appropriate. David and I are also explaining the possibility of detecting overt primitive steps which would regularly imply a primitive mental operator either precede or succeed the primitive step. There may however, be too many conditions which must be tested in order to make such inferences. This gets us into language dependent types of problems. Maybe Word Net can help?

We are also changing our time line in order to take advantage of the SPAWAR project needs. As you may recall we proposed to apply the tool in the third year. We believe we are far enough along to accelerate the application of the tool for developing and structuring curriculum content for SURTASS console operator training. These mental operators which are giving us a headache are needed for simulation models of user computer interfaces but would not typically be used in instruction. That is, we would not include in an instructional setting statements such as "forget what is in working memory" or "recall what is in working memory".

In parallel I will be contacting Sharon Denny and John Anderson to develop some algebra models using the tool and to get some feedback from them as to its applicability in developing mathematical models for instruction.

Thanks for sending me the information on the Advanced Instructional Design Advisor, it made for good reading. I will be reporting on the trip to Berlin to fill you in on how our research is being received by the European community.

Sincerely,

Kent E. Williams